Tanaffos (2008) 7(3), 9-12

Is It Time to Wake Up to Sleep Disorders?

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Field of sleep medicine has evolved significantly and undergone tremendous growth during last three decades. Early case reports and case series discussed the typical hypoventilation in sleepy, red-faced, morbidly obese individuals known as Pickwickian Syndrome after Charles Dickens's fictional character "Joe, the fat boy". Symptomatic obstructive sleep apnea (OSA) afflicts an estimated 4 percent of men and 2 percent of women aged 30-70 years (1).

OSA is characterized by repeated pharyngeal obstructions during sleep causing airflow cessation (apnea) or reduction (hypopnea). Number of apneas and hypopneas per hour of sleep, apnea + hypopnea index (AHI), is used to index severity of OSA. OSA events produce arousals, fragment sleep, and are often accompanied by oxygen desaturation. Common symptoms include daytime sleepiness, fatigue, irritability, disturbed sleep, memory problems, snoring, morning headache, waking up feeling unrefreshed, witnessed apnea, and diminished quality of life (2,3).

Recent epidemiological studies link untreated OSA to hypertension, heart disease, stroke, psychiatric comorbid conditions and increased risk of motor vehicle accidents (4-9). Use of health care services is significantly higher in patients with OSA compared to non-OSA subjects (10-12). Various retrospective and recent prospective studies showed significant increase in mortality rate among patients with clinically significant obstructive sleep apnea. More than twenty years ago, He and colleagues showed that mortality rate was significantly higher in subjects with apnea index more than 20 compared to ones with less severe disease (13). In prospective mortality follow up of Wisconsin Cohort study, the all cause mortality, independent of age, sex, body mass index, and other potential confounders increased by 3-fold in patients with severe OSA (AHI > 30) compared to subjects with no OSA (AHI < 5). The increased mortality was even more pronounced when CPAP users were excluded (14). Furthermore, cardiovascular comorbidity increased in severe OSA subjects compared to non-OSA subjects. The mortality risk was 50% greater for those with mild and moderate OSA compared to subjects without OSA (14). In another prospective cohort study, moderate-to-severe OSA was associated with 33% mortality, while mortality rate was not different in mild OSA and non-OSA subjects over a 14-year follow up (15). The increased mortality remained significant (hazard ratio of 6.24) after adjustment for competing risk factors for mortality including after adjustment for age, gender,

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mean arterial pressure, total cholesterol, high density lipoprotein cholesterol, body mass, diabetes, angina, and smoking status (15). Obstructive sleep apnea is also associated with significant comorbid conditions. For example, in the Sleep Heart Health study, Shahar and colleagues reported a 42% greater odds of prevalent coronary heart disease in individuals with AHI>11 compared to individuals with AHI<1.3 (16). We also found a high prevalence of diagnosed heart failure (HF) in our population. In our cohort, more than 13.5% of patients with symptomatic sleep apnea had HF diagnosis. This is in contrast to the veteran beneficiaries without sleep apnea diagnosis among which only 4.4% were diagnosed with HF (17). Although data are sparse, published epidemiological studies report associations between OSA and HF. Furthermore, the Sleep Health Heart Study showed that subjects with OSA and AHI $\geq$ 11 were more likely to have heart failure independent of other known risk factors (16, 18, 19). Another systemic vascular comorbid condition, diagnosed cerebrovascular accident (CVA), likewise was more prevalent in patients with sleep apnea than in the parent population. Association between CVA and OSA is well documented in other published literature (16, 20-22). In a recent report on data from the Wisconsin Sleep Cohort Study, high odds ratios for stroke with sleep apnea were found in both cross-sectional and prospective analyses (23). In addition to cardiovascular comorbid conditions, prevalence of insulin resistance and type II diabetes is higher in patients with OSA. A major confounding factor is obesity in these patients.

The current diagnostic standard for OSA involves recording electroencephalography, electro-oculography, electromyography, airflow, respiratory effort, heart rhythm, oximetry, and leg movements continuously, all night, in a sleep laboratory with a technologist present. This procedure is called attended polysomnography (PSG) and is thorough but expensive (24). Accurate diagnosis of OSA and other sleep disorders not only depends on thorough clinical evaluation by trained sleep experts but also on the quality of PSG recording. In turn, quality of the PSG mainly depends on the experience of trained sleep technologists and high quality data recording. Continued monitoring of sleep patients and correction of malfunctioning channels and artifacts are needed and highly depend on experience of sleep technologists. Subsequently, high quality scoring of PSGs by trained sleep technologists provides an accurate summary of sleep stages, respiratory events, periodic limb movements and arousals. Finally, a sleep specialist with proper training and experience interprets the study and provides treatment recommendations. Dependence of sleep study on a comprehensive team of health care professionals may have been a major reason for slower expansion of sleep centers in third world countries.

Continuous positive airway pressure (CPAP) is the first line standard of care for treating OSA. By delivering a fan-generated flow, CPAP maintains airway patency by creating a “pneumatic splint”. In most patients, CPAP dramatically reduces or eliminates apnea and hypopnea episodes (25,26). However, CPAP effectiveness depends directly on patient’s utilization of the machine and mask. Adherence to CPAP therapy is less than optimal. Generally, 70-75% of patients with SDB accept CPAP. From these, about 40-60% will continue using CPAP for 1 year, or longer (27), and even fewer use it to the extent prescribed. Thus, non-adherence is a major therapeutic challenge. Alternatives to CPAP include weight loss, oral appliances, and surgery. Many studies show strong associations between obesity and OSA (1,17,28-30). Weight loss improves OSA (28). However, achieving and maintaining weight loss is difficult to accomplish. Dental appliances are fairly effective for treating mild to moderate OSA. Upper airway

surgery may be helpful in some cases of OSA.

In summary, obstructive sleep apnea is a prevalent chronic disease that is associated with increased mortality, medical and psychiatric morbid conditions and increased use of health care services. Diagnosis and treatment of OSA depend on a comprehensive team of experts including pulmonologists, otolaryngologists, sleep technologists and dentists. Effective therapy of OSA patients with CPAP needs patient education and continued follow up to assure efficacy and safety. Successful growth of sleep medicine as a new field in many developing countries including Iran not only depends on training sleep experts and founding sleep disorders centers but also on education of public and health care providers about healthy sleep and related disorders. As any new field, academic institutes and professionals are primarily responsible for disseminating sleep medicine. IS IT TIME TO WAKE UP TO SLEEP DISORDERS?

REFERENCES

1. Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered breathing among middle-aged adults. ***N Engl J Med*** 1993; 328 (17): 1230- 5.
2. Guilleminault C, Partinen M, Quera-Salva MA, Hayes B, Dement WC, Nino-Murcia G. Determinants of daytime sleepiness in obstructive sleep apnea. ***Chest*** 1988; 94 (1): 32- 7.
3. Flemons WW, Tsai W. Quality of life consequences of sleep-disordered breathing. ***J Allergy Clin Immunol*** 1997; 99 (2): S750- 6.
4. Findley LJ, Weiss JW, Jabour ER. Drivers with untreated sleep apnea. A cause of death and serious injury. ***Arch Intern Med*** 1991; 151 (7): 1451- 2.
5. Quan SF, Howard BV, Iber C, Kiley JP, Nieto FJ, O'Connor GT, et al. The Sleep Heart Health Study: design, rationale, and methods. ***Sleep*** 1997; 20 (12): 1077- 85.
6. Nieto FJ, Young TB, Lind BK, Shahar E, Samet JM, Redline S, et al. Association of sleep-disordered breathing, sleep apnea, and hypertension in a large community-based study. Sleep Heart Health Study. ***JAMA*** 2000; 283 (14): 1829- 36.
7. Décary A, Rouleau I, Montplaisir J. Cognitive deficits associated with sleep apnea syndrome: a proposed neuropsychological test battery. ***Sleep*** 2000; 23 (3): 369- 81.
8. Weaver TE, Laizner AM, Evans LK, Maislin G, Chugh DK, Lyon K, et al. An instrument to measure functional status outcomes for disorders of excessive sleepiness. ***Sleep*** 1997; 20 (10): 835- 43.
9. Sharafkhaneh A, Giray N, Richardson P, Young T, Hirshkowitz M. Association of psychiatric disorders and sleep apnea in a large cohort. ***Sleep*** 2005; 28 (11): 1405- 11.
10. Albarrak M, Banno K, Sabbagh AA, Delaive K, Walld R, Manfreda J, et al. Utilization of healthcare resources in obstructive sleep apnea syndrome: a 5-year follow-up study in men using CPAP. ***Sleep*** 2005; 28 (10): 1306- 11.
11. Bahammam A, Delaive K, Ronald J, Manfreda J, Roos L, Kryger MH. Health care utilization in males with obstructive sleep apnea syndrome two years after diagnosis and treatment. ***Sleep*** 1999; 22 (6): 740- 7.
12. Banno K, Manfreda J, Walld R, Delaive K, Kryger MH. Healthcare utilization in women with obstructive sleep apnea syndrome 2 years after diagnosis and treatment. ***Sleep*** 2006; 29 (10): 1307- 11.
13. He J, Kryger MH, Zorick FJ, Conway W, Roth T. Mortality and apnea index in obstructive sleep apnea. Experience in 385 male patients. ***Chest*** 1988; 94 (1): 9- 14.
14. Young T, Finn L, Peppard PE, Szklo-Coxe M, Austin D, Nieto FJ, et al. Sleep disordered breathing and mortality: eighteen-year follow-up of the Wisconsin sleep cohort. ***Sleep*** 2008; 31 (8): 1071- 8.
15. Marshall NS, Wong KK, Liu PY, Cullen SR, Knuiman MW, Grunstein RR. Sleep apnea as an independent risk factor for all-cause mortality: the Busselton Health Study. ***Sleep*** 2008; 31 (8): 1079- 85.
16. Shahar E, Whitney CW, Redline S, Lee ET, Newman AB, Javier Nieto F, et al. Sleep-disordered breathing and cardiovascular disease: cross-sectional results of the Sleep Heart Health Study. ***Am J Respir Crit Care Med*** 2001; 163 (1): 19- 25.

17. Sharafkhaneh A, Richardson P, Hirshkowitz M. Sleep apnea in a high risk population: a study of Veterans Health Administration beneficiaries. ***Sleep Med*** 2004; 5 (4): 345- 50.
18. Sin DD, Fitzgerald F, Parker JD, Newton G, Floras JS, Bradley TD. Risk factors for central and obstructive sleep apnea in 450 men and women with congestive heart failure. ***Am J Respir Crit Care Med*** 1999; 160 (4): 1101- 6.
19. Javaheri S, Parker TJ, Liming JD, Corbett WS, Nishiyama H, Wexler L, et al. Sleep apnea in 81 ambulatory male patients with stable heart failure. ***Types and their prevalences, consequences, and presentations. Circulation*** 1998; 97 (21): 2154- 9.
20. Palomäki H. Snoring and the risk of ischemic brain infarction. ***Stroke*** 1991; 22 (8): 1021- 5.
21. Partinen M, Palomäki H. Snoring and cerebral infarction. ***Lancet*** 1985; 2 (8468): 1325- 6.
22. Neau JP, Meurice JC, Paquereau J, Chavagnat JJ, Ingrand P, Gil R. Habitual snoring as a risk factor for brain infarction. ***Acta Neurol Scand*** 1995; 92 (1): 63- 8.
23. Arzt M, Young T, Finn L, Skatrud JB, Bradley TD. Association of sleep-disordered breathing and the occurrence of stroke. ***Am J Respir Crit Care Med*** 2005; 172 (11): 1447- 51.
24. Hirshkowitz M., Kryger MH. Monitoring Techniques for Evaluating Suspected Sleep-disordered Breathing in Adults. In: Kryger MH, Roth T, Dement WC, editors. Principles and Practice of Sleep Medicine. Philadelphia: Saunders Press, 2005.
25. Mansfield DR, Gollogly NC, Kaye DM, Richardson M, Bergin P, Naughton MT. Controlled trial of continuous positive airway pressure in obstructive sleep apnea and heart failure. ***Am J Respir Crit Care Med*** 2004; 169 (3): 361- 6.
26. Tkacova R, Rankin F, Fitzgerald FS, Floras JS, Bradley TD. Effects of continuous positive airway pressure on obstructive sleep apnea and left ventricular afterload in patients with heart failure. ***Circulation*** 1998; 98 (21): 2269- 75.
27. Weaver TE. Adherence to Continuous Positive Airway Pressure Treatment and Functional Status in Adult Obstructive Sleep Apnea. In: Pack AI, editor. Sleep Apnea. Pathogenesis, Diagnosis, and Treatment. New York: MARCEL DEKKER, 2002: 523-554.
28. Young T, Peppard PE, Gottlieb DJ. Epidemiology of obstructive sleep apnea: a population health perspective. ***Am J Respir Crit Care Med*** 2002; 165 (9): 1217- 39.
29. Young T, Shahar E, Nieto FJ, Redline S, Newman AB, Gottlieb DJ, et al. Predictors of sleep-disordered breathing in community-dwelling adults: the Sleep Heart Health Study. ***Arch Intern Med*** 2002; 162 (8): 893-900.
30. Redline S, Strohl KP. Recognition and consequences of obstructive sleep apnea hypopnea syndrome. ***Clin Chest Med*** 1998; 19 (1): 1- 19.